

of his own generation, there is no doubt that some such action, if only on grounds of public convenience, is necessary, and it is more than probable that Australians of another generation will be grateful for the prescription of a stereotyped list of names.

### THE CHEMISTRY OF CALCAREOUS CEMENTS.

*The Chemistry of Testing of Cement.* By Dr. C. H. Desch. Pp. xi+267. (London: E. Arnold, 1911.) Price 10s. 6d. net.

THE "cement" treated of in this volume is the group of calcareous cements—that is, the plastic materials employed to produce adhesion between stones and bricks in the construction of buildings and engineering works. The book deals, shortly but clearly, with the manufacture of the various kinds of calcareous cements, with their components, constitution, and properties, and with the mechanical and chemical methods of testing them.

Owing to the extending employment of concrete the production of cement is becoming more and more important, and the demands upon its qualities increasingly stringent. These more exacting requirements have so far been met with a remarkable degree of success, partly by improvements in mechanical processes, but also to no small extent through the co-operation of the chemist. For two reasons the services of the latter are likely to become of yet greater value in the industry. On one hand a still higher standard of quality may be demanded in the finished product, and, on the other, a larger variety of raw materials may be found to be utilisable in the production.

The complex character of the substances entering into the composition of calcareous cements, and the obstacles in the way of ready experiment with the products, have in the past greatly limited our knowledge of the chemical reactions which occur in the making and "setting" of these bodies. In modern practice, however, two things are helping to shed light upon the dark places. One is the introduction of "etching" methods, similar to those employed in metallography, for studying the structure of cements in their various phases; the other is the conception of cements as, essentially, colloids. Both these matters are fully explained and their importance emphasised in the volume before us.

The view adopted by the author as to what takes place during the setting of Portland cement is substantially that of Dr. Michaëlis. Assuming for the purpose of discussion that the cement materials consist of lime, alumina, and silica only, then the essential hydraulic constituent, alite, is formed from these by the action of heat during the process of manufacture. It is regarded as a solid solution of calcium silicates and aluminates. When water is added to the cement, it partly decomposes the alite, hydrolysing the aluminates in the first instance. The solution thus produced is a supersaturated one, and it presently deposits tricalcium aluminate. According to the quantity of water in the mixture, the deposit is either mainly colloidal or mainly crystalline; if the propor-

tion of water is small it favours the production of a colloidal "gel." The excess of lime above that required for tricalcium aluminate remains in solution, or a part may be deposited as crystals of calcium hydroxide. This process is regarded as probably corresponding with the "initial set" of the cement.

As regards the subsequent gradual hardening, the argument is that water acts much more slowly on the calcium silicate contained in alite than on the aluminates, but when hydrolysis does occur the calcium silicate separates out in the colloidal form. The gel thus produced forms a coating round the cement particles, protecting them from further direct action of the water. But as the latter slowly diffuses through the colloidal coating, more and more of the alite is slowly hydrolysed, and the lime set free is absorbed by the gel, which thereby increases gradually in density and hardness, and loses its plastic qualities. To this gradual desiccation of the gel, which takes place even when the cement is immersed in water, is due the eventual hardening of the mass.

Evidence for the actual existence of colloid products in hardened cements is found in the fact that some of the components can be stained with eosin. Etching with acids shows the structure of the unchanged cement in the interior of the particles, around and between which lies the dyed colloidal gel.

The volume embodies the chief results of modern inquiries into what is admittedly a difficult subject. It is written in a true scientific spirit, and would be an excellent book to place in the hands of a chemist with progressive ideas, who wishes to study carefully the chemistry of calcareous cements. C. S.

### GEOPHYSICS.

*Physik der Erde.* By Prof. M. P. Rudzki. Pp. viii+584. (Leipzig: Chr. Herm. Tauchnitz, 1911.) Price 14 marks.

THE course of lectures at the University of Cracow published by Dr. Rudzki in the book under review covers a wide range. The subject-matter lies on the border-line of astronomy, mathematics, geography, and geology, and the lectures have coordinated these different sciences very successfully. By readers in this country, where specialised studies so largely cramp workers into one narrow domain, the book should be greatly appreciated. It is much to be desired that more opportunity could be found for similar work in British educational methods; for those who agree with this view Dr. Rudzki's work will prove a useful stimulus.

In saying that the lectures have successfully coordinated the different subjects represented, the reviewer does not wish to suggest that the treatment is necessarily the happiest from the point of view of a student in this country. For instance, while the mathematical reader will find much to interest him and very little that he cannot follow in the subjects outside his own domain, he will find the mathematical part of the work occasionally incomplete or sketchy. At the same time the reader who is not a professed mathematician must frequently find the mathematics

beyond his reach. Rather more or rather less mathematics would probably suit a larger class of students. A second weakness of the book, and one which robs it of some value as a systematic treatise, lies in the somewhat arbitrary way in which certain branches of geophysics have been neglected, while others have been accorded very full treatment.

In general, however, the ground has been very thoroughly covered. Many valuable references are given throughout, and save for the last few years they seem very fairly complete. In his preface the author refers with regret to several interesting investigations which have appeared too late to be made use of in the text of the book. The reviewer has found few instances of work overlooked. Taking the work of this country alone—work which has in general received a full and generous treatment—the only important omissions that he has noted have been some of the investigations on wave problems of Prof. Lamb and the scientific results of Sir Ernest Shackleton's last Antarctic voyage. But all students reading the book must find many references which will be new to them, and the book has been made more serviceable by a useful index of authors and subjects.

Throughout the whole range of subjects considered—and there are included geodesy (practical and theoretical), seismology, isostasy, and the theories of tides, ocean currents, waves, seiches, rivers and glaciers—the treatment is fresh and full. As a type of the questions discussed in a most interesting manner the winding form of a river-bed may be selected for mention, also the problem of glacial epochs and the differing views as to the nature of the earth's interior. The general answer which Dr. Rudzki gives to the solutions so far offered for most of the problems he discusses is "Not proven," and no fault can be found with him for adopting so cautious a position. The book is replete with suggestions of unsolved problems, and would supply fruitful reading to many a student on the look out for a piece of research off the ordinary lines.

F. STRATTON.

#### THE EVOLUTION OF MAN.

- (1) *Anthropogenie oder Entwicklungsgeschichte des Menschen, Keimes- und Stammesgeschichte.* By Prof. E. Haeckel. Sechste Auflage. Erster Teil, Keimesgeschichte des Menschen. Pp. xxviii+432+xvi plates. Zweiter Teil, Stammesgeschichte des Menschen. Pp. x+(433-992)+(xvii-xxx) plates. (Leipzig: W. Engelmann, 1910.)
- (2) *Der Mensch: sein Ursprung und seine Entwicklung.* By Prof. W. Leche. (Nach der zweiten schwedischen Auflage.) Pp. viii+375. (Jena: Gustav Fischer, 1911.) Price 7.50 marks.

BOTH these books are popular treatises discussing "man's place in nature" (to use the title of their English prototype), his origin, and development. They cover practically the same ground, and both aim at presenting the results of highly technical biological investigations in a form that will be intelligible to the educated layman. Nevertheless

there is a marked contrast between them, one that in a measure reflects the influence of the difference in the attitude of the educated public towards the problems of evolution and the descent of man thirty-seven years ago and now. One of them is a weapon, forged in times of struggle, for the purpose of carrying offensive operations into the camp of those who were using every influence that casuistry and sentimentality could arouse to discredit Darwin and all his works. The other was written in more peaceful circumstances, long after such foolish animosities were buried, as one of the innumerable series of tributes which every country and class united in paying to Darwin's memory, on the occasion of the fiftieth anniversary of the publication of "The Origin of Species," two years ago.

This is the sixth edition of Haeckel's famous book. It first saw the light in 1874, in the days when the mere suggestion of the idea of evolution, in reference to man, was still regarded as "insulting" by many people. Its author was the most ardent and combative upholder of evolutionary ideas on the Continent, and he made no attempt to soothe the susceptibilities of his readers, preferring rather to set forth unpalatable views in the frankest and certainly not the least distasteful way. The book was originally flung as a challenge to the opponents of Darwinism, who replied by describing it as "a fleck of shame on the escutcheon of Germany."

Since then a vast change has taken place in the attitude of educated men towards the problem of evolution; but Haeckel has made surprisingly few changes in his book. From time to time, in the various successive editions, he has added liberally to the supply of illustrations, and tacked on a variety of tit-bits of new information, such as references to Pithecanthropus, the recent work on "the demonstration of the blood-relationship" of apes and man, and the results of investigations on the fate of the tail in man; but these are mere scraps of corroborative detail—embellishments to the edifice built in 1874, without altering the plan of the building or enlarging its dimensions. The great modern movements of biological thought in reference to heredity and evolution, and the results of recent morphological research, have made little or no impression upon Haeckel's book; its scope has not been enlarged to include the new learning; in spite of its veneer of modernity it is still a typical product of thirty years ago. But it is a wonderful tribute to its excellence that a book which does not claim to represent the present state of knowledge should maintain its position in competition with more recent works; it has, in fact, now attained the venerable rank of a classic.

The present edition is little more than a reprint of the fifth edition, which has appeared in an English translation. Slight additions have been made to the accounts of Amphioxus and the embryology of the chick, and a few more illustrations have been inserted; but these are mostly taken from old sources.

The author does not even provide a new preface; but in his introduction to the previous edition (1903) he frankly admitted that the literature relating to the problems discussed in his treatise had become so